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LIVESTOCK-ASSOCIATED MRSA CC398 SURVIVAL IN MANURE

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Background: The application of manure to agricultural production is common practice in many countries. In Denmark 30 million tons of swine manure alone, is spread on Danish fields as fertilizer on a yearly basis. This application is of great importance for a sustainable agriculture, but it also possesses a potential risk of a dissemination route of pathogenic microorganisms and resistance genes. Therefore, we conducted a study to examine the presence of MRSA in manure along with the decimation time of MRSA in swine manure under conditions similar to those of a conventional swine barn. The aim of the study was to evaluate whether MRSA is likely to survive the passage of manure from the swine barn to the agricultural land.

Methods: The survival of MRSA in natural positive manure samples was investigated at three temperatures, 5°C, 15°C and 37°C. Additionally, decimation times of two MRSA isolates were investigated in spiked samples at four temperatures 5°C, 15°C, 25°C and 37°C. Isolates of spa type t011 and t034, the two most prevalent spa types in Danish pig production, were inoculated in swine manure at a spiking level of 1.00+07 colony forming units (CFU) per ml. Unspiked control samples were included at every temperature. The bacterial load of every sample was determined at multiple time points until MRSA was no longer detectable by direct plating.

Results: Our results show that MRSA was able to survive for at least 20 days at 5°C and 16 days at 15°C in natural MRSA positive swine manure (natural load: 5.00E+00 – 1.90E+02 CFU/ml). The decimation time (T90) in swine manure spiked with 1.00+07 CFU/ml MRSA was at least 12 days at 5°C, 3.7 days at 15°C, 1.2 days at 25°C and 1 day at 37°C.

Conclusions: The survival of MRSA in manure was shown to be temperature dependent. Furthermore, the duration of MRSA survival for at least 16 days at temperatures likely to prevail during normal manure storage (15°C), may constitute a risk that the MRSA can transit the manure storage tank and thereby reach the manured fields in a viable state during seasons of manure application.

Keywords: MRSA, Manure, Survival, Decimation time